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NASA Administrator Charles Bolden Visits Marshall Center

By Megan Davidson

NASA Administrator Charles Bolden toured the agency's Marshall Space Flight Center on March 14, where work is underway on the Space Launch System (SLS) -- the largest, most powerful rocket ever built.

Bolden kicked off his visit with an all hands meeting and question-and-answer session with Marshall Center team members. Marshall Engineering Directorate Director

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NASA Administrator Charles Bolden takes questions from the audience during an all hands meeting March 14 with Marshall Center team members. (NASA/MSFC/Emmett Given)

2013 Astronaut Candidate Class 'Eight Balls' Visits Marshall

By Jessica Eagan

Nicknamed the "Eight Balls," seven of the eight members of [NASA's 2013 Astronaut Candidate Class](#) visited NASA's Marshall Space Flight Center on March 6 to learn more about the center and its contributions to NASA's missions.

The candidates received a center overview and toured high-tech facilities, including development labs in Buildings 4205 and 4755 for

*See **Astronaut Candidate Class** on [page 3](#)*



The 2013 Astronaut Candidate Class visited the Thrust Vector Control Test Lab at Marshall's Propulsion Research Development Laboratory where engineers are developing and testing the Space Launch System's guidance, navigation and control software and avionics hardware. (NASA/MSFC/Fred Deaton)

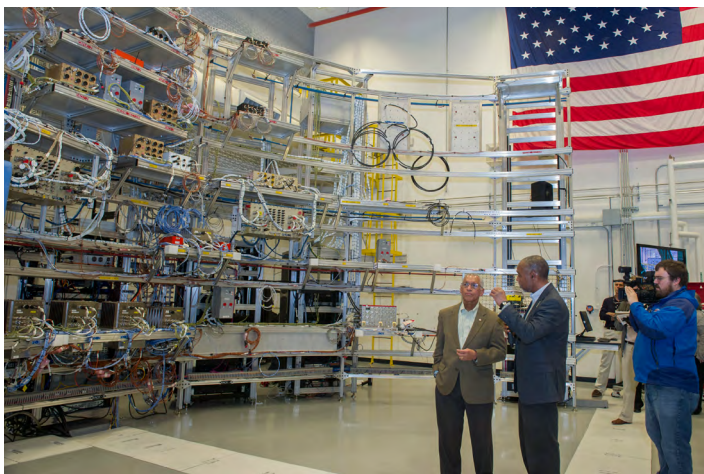
Bolden Visit *Continued from page 1*

Chris Singer; Science & Technology Office Manager Dan Schumacher; and SLS Program Manager Todd May provided an overview on the center's accomplishments.

Bolden's tour of the center included Marshall's System Integration Laboratory. He, along with members of Alabama's congressional delegation and area community leaders, viewed the SLS avionics unit arranged in flight configuration, and booster hardware, which are being integrated and tested together to ultimately guide the entire vehicle. They also watched flight software simulations of how the SLS will perform during launch.

"It's great to be back at Marshall and see, firsthand, the impressive progress made by the SLS team," said Bolden. "SLS will help take American astronauts to an asteroid and Mars, and it all starts here in Huntsville. My hat's off to the entire team for their hard work."

The completed rocket will stand 321 feet tall and include the core stage, which stores the cryogenic liquid hydrogen and liquid oxygen that will fuel the vehicle's four RS-25 engines and, with two five-segment solid rocket boosters, power the rocket.



While visiting Marshall, Bolden, left, talks with Kurt Jackson, SLS integrated avionics and software discipline lead engineer, about progress on the SLS avionics system. Bolden toured the System Integration Laboratory, where the avionics units are arranged in flight configuration, along with booster hardware. The modern technology is being integrated and tested together to ultimately guide the entire vehicle. He also watched flight software simulations of how the SLS will perform during launch. (NASA/MSFC/Emmett Given)



Bolden, seated, second from left, and Marshall Center Director Patrick Scheuermann take a "selfie" with the Marshall Center social media team. The photo was well received on NASA and Marshall social media accounts, and garnered more than 675 retweets and 985 favorites on Twitter alone. (NASA/MSFC/Emmett Given)

Engineers from NASA and The Boeing Co., the prime contractor for the SLS core stage and avionics, integrated and powered up the core stage avionics unit for its initial run, called "First Light," in early January and have since been running numerous tests using the latest flight software.

"This is a significant and exciting milestone for both NASA and Boeing," said Lisa Blue, stages avionics system manager in the SLS Program Office at Marshall. "We are using and testing technologies that include the most powerful computer processor ever used in a flight system."

During his visit to Marshall, Bolden also toured the Nuclear Thermal Propulsion Materials Laboratory, and met with several teams -- including a group from the Office of Strategic Analysis & Communications and Marshall Television -- to hear more about the work going on at the center. The group continues to enhance the center's social media presence.

Davidson, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Astronaut Candidate Class *Continued from page 1*

NASA's Space Launch System (SLS) -- the heavy lift rocket that will launch future crews to deep space; and the [Payload Operations Integration Center](#) in Building 4663 -- the heartbeat for International Space Station science, where team members plan and coordinate all the research activities aboard the orbiting laboratory.

Another tour stop included the [Advanced Welding and Manufacturing Facility](#). It is here where innovative friction stir welding processes bring together affordability for SLS. Metals are transformed from a solid state into a "plastic-like" state, using a rotating pin tool to soften, stir and forge a bond between two metal plates to form a uniform welded joint -- a vital requirement of next-generation space hardware. The candidates also toured the [Environmental Control and Life Support System](#) facility where Marshall engineers have led the design, testing and development of the space station's support system.

They were accompanied by veteran astronaut [Patrick Forrester](#), who flew on STS-105 in 2001, STS-117 in 2007 and STS-128 in 2009; and Duane Ross, manager for Astronaut Candidate Programs at NASA's Johnson Space Center.

"The Marshall Center is an integral part of the NASA team," said Forrester. "The candidates heard briefings about SLS and how, hopefully, one of these days they'll get to be a part of that program. They also learned about the Payload Operations Integration Center because as they wait for spaceflight, they'll work with the International Space Station and the payloads.

"It's just great to come to Alabama and Marshall Center," Forrester added. "NASA wouldn't be complete without it."

The 2013 class was selected from the second largest number of applications NASA ever has received -- more than 6,100. It took a year and a half to officially name the agency's newest members due to the in-depth interview processes. From there, four men and four women, all in their 30s, were selected, including five military aviators, a military doctor, an assistant professor at Harvard Medical School in Boston and an employee of the National Oceanic and Atmospheric Administration. The group will receive



The astronaut class examines friction stir weld development panels while learning about the welding processes at the Advanced Welding and Manufacturing Facility during their tour at the Marshall Center. (NASA/MSFC/Fred Deaton)

an array of technical training to prepare for missions to low-Earth orbit, an asteroid or even Mars.

"Astronauts are a NASA resource," said Ross. "The candidates need to be educated in everything the agency does because it affects them and their ability to fly in space."

Twenty-one astronaut classes have been selected since 1959, and all have adopted nicknames. NASA tradition calls for the previous class to give the new group a name, so the Eight Balls can thank the 2009 group. Since the eight ball in the game of pool is played last, the 2009 class' wish is that they fly before anyone in the 2013 class.

It will be approximately two years before the Eight Balls can be up for a mission assignment. Being a candidate does not ensure selection as an astronaut. Those civilians who successfully complete the training will become federal employees. In the unlikely case a candidate does not successfully complete the training, they may be placed in another position at NASA, depending upon agency requirements and labor constraints at that time.

To learn more about the astronaut candidates and to view the class gallery, visit [here](#).

Eagan, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Advancing Progress on SLS Avionics

From left, Wayne Arrington, a Boeing Co. technician, and Steve Presti, a mechanical technician at NASA's Marshall Space Flight Center, install Developmental Flight Instrumentation Data Acquisition Units in Marshall's Systems Integration and Test Facility. The units are part of NASA's Space Launch System (SLS) core stage avionics, which will guide the biggest, most powerful rocket in history to deep space missions. When completed, the core stage will be more than 200 feet tall and store cryogenic liquid hydrogen and liquid oxygen that will feed the vehicle's RS-25 engines. The hardware, software and operating systems for the SLS are arranged in flight configuration in the facility for testing. The new Data Acquisition Units will monitor vehicle behavior in flight -- like acceleration, thermal environments, shock and vibration. That data will then be used to validate previous ground tests and analyses models that were used in the development of the SLS vehicle. (NASA/MSFC/Fred Deaton)



NASA Marshall Meteor Experts Host First Reddit 'Ask Me Anything'

By Janet Anderson

NASA meteor and fireball experts Bill Cooke, lead for NASA's Meteoroid Environment Office; Danielle Moser and Rhiannon Blaauw, both meteor physicists, answered questions about meteors, meteor showers and fireballs recently using the Reddit Ask Me Anything (AMA) platform.

Reddit is a popular online community where users vote on content they find interesting. The Ask Me Anything sub-forum features interviews with volunteers who answer questions about their specific expertise.

Questions asked during the AMA ranged from topics including minerals obtained from meteors, how a person could be more involved in space exploration, and even some questions about the movie "Gravity."

The most popular question received by the meteor experts, and receiving 25 up votes was the question, "How useful are the minerals we can obtain from meteors or are they just as easily obtainable on earth?" Bill Cooke responded with, "Meteorites contain basically the same

elements as found on Earth, just in different abundances. So it is easier to get them here on Earth than wait for them to come to us. Exceptions may be iridium, which is more abundant in meteorites than on Earth, so if you're constructing an inter-dimensional portal like in the movie "Thor," you may have a need for such."

Cooke, Moser and Blaauw answered 129 questions during the 75-minute chat and received 28 additional questions after the chat. So far the AMA has a total of 295 comments and +500 votes, with an overall approval rating of 76 percent.

Approximately 5,300 individuals potentially viewed the experts' responses during the live event, with tens of thousands more having access to the permanent transcript.

You can view the complete Reddit AMA [here](#).

Anderson is a public affairs officer in the Office of Strategic Analysis & Communications.

NASA Marshall Kicks Off Weather Webchat Series with a Q&A about Floods

During National Flood Safety Awareness Week, Patrick Gatlin and Timothy Lang, atmospheric scientists from NASA Marshall Space Flight Center's Earth Science Office, will host a webchat about flooding and NASA precipitation measurement research.

Gatlin and Lang will listen and respond to weather questions from a public audience on March 19 from 7-9 p.m.

For more information, visit [here](#).

NASA Marshall and Sierra Nevada Corporation Enhance Partnership for Dream Chaser Science Payloads

From news release

NASA's Marshall Space Flight Center and Sierra Nevada Corporation (SNC) announced an expanded collaboration to advance the planning and development of potential science research during future Dream Chaser spacecraft missions at a press conference on March 11.

Under a new annex to a current Space Act Agreement, Marshall's Mission Operations Laboratory will provide technical expertise to SNC for planning the integration of scientific payloads on its Dream Chaser spacecraft under their Advanced Development Program.

SNC's Dream Chaser is a multi-mission-capable spacecraft designed for low-Earth orbit.

"We are glad to share the knowledge and expertise we've gained through our decades of experience with payload development for space shuttle missions and operating and maintaining science research on the International Space Station," said Patrick Scheuermann, Marshall Center director. "We have enjoyed a successful partnership with Sierra Nevada Corporation for more than two years and look forward to continued collaboration."

Marshall engineers will provide SNC with recommendations on payload capability, best practices for ground processing of payloads, integration of in-space experimental science payloads with commercial space vehicles, and on-orbit operation of science payloads. Teledyne Brown Engineering will also provide support to SNC under a teaming agreement.

"We are pleased to announce that SNC is increasing our presence in Alabama by expanding our relationship with the Marshall Space Flight Center and adding Teledyne Brown Engineering to our growing Dream Chaser team. Each of these organizations are experts in their respective fields and have already begun applying their invaluable knowledge and experience," said Mark N. Sirangelo, corporate vice president and head of SNC's Space Systems.

"We are very pleased to team with Sierra Nevada in the development of the Dream Chaser," said Rex



During a March 11 news conference at the Marshall Center, the Sierra Nevada Corporation (SNC) announced an enhanced partnership with Marshall and Teledyne Brown Engineering to advance the planning and development of potential science research during future SNC Dream Chaser spacecraft missions. Talking with media about the partnership are, from left, Paul Gilbert, deputy manager of the Marshall Flight Programs and Partnerships Office; Mark Sirangelo, corporate vice president and head of Sierra Nevada Corporation's Space Systems; Rex Geveden, executive vice president of Teledyne Technologies; and Mark McEylea, chief of the Advanced Planning and Integration Office for Marshall's Mission Operations Laboratory. (NASA/MSFC/Emmett Given)

D. Geveden, executive vice president of Teledyne Technologies Incorporated. "This is an exceptional opportunity to apply our capabilities in payload development and integration to an exciting new space transportation system."

Marshall and SNC have partnered since December 2011 under a reimbursable Space Act Agreement. Previously, SNC sought out Marshall experts to provide wind tunnel testing for its Dream Chaser/United Launch Alliance Atlas V launch stack configuration in the center's 14-square-inch trisonic wind tunnel. The data generated from the series of tests helped define the vehicle's aerodynamic characteristics in flight.

For more information about Sierra Nevada Corporation's Dream Chaser, visit [here](#).

Chandra and XMM-Newton Provide Direct Measurement of Distant Black Hole's Spin

From news release

Astronomers have used NASA's Chandra X-ray Observatory and the European Space Agency's (ESA's) XMM-Newton to show a supermassive black hole six billion light years from Earth is spinning extremely rapidly. This first direct measurement of the spin of such a distant black hole is an important advance for understanding how black holes grow over time.

Black holes are defined by just two simple characteristics: mass and spin. While astronomers have long been able to measure black hole masses very effectively, determining their spins has been much more difficult.

In the past decade, astronomers have devised ways of estimating spins for black holes at distances greater than several billion light-years away, meaning we see the region around black holes as they were billions of years ago. However, determining the spins of these remote black holes involves several steps that rely on one another.

"We want to be able to cut out the middle man, so to speak, of determining the spins of black holes across the universe," said Rubens Reis of the University of Michigan in Ann Arbor, who co-authored a paper describing this result that was published online in the journal *Nature*.

Reis and his colleagues determined the spin of the supermassive black hole that is pulling in surrounding gas, producing an extremely luminous quasar known as RX J1131-1231 (RX J1131 for short). Because of fortuitous alignment, the distortion of space-time by the gravitational field of a giant elliptical galaxy along the line of sight to the quasar acts as a gravitational lens that magnifies the light from the quasar. Gravitational lensing, first predicted by Einstein, offers a rare opportunity to study the innermost region in distant quasars by acting as a natural telescope and magnifying the light from these sources.

The X-rays are produced when a swirling accretion disk of gas and dust that surrounds the black hole creates a multimillion-degree cloud, or corona near the black hole. X-rays from this corona reflect off the inner edge of the accretion disk. The strong gravitational forces near the black hole alter the reflected X-ray spectrum. The larger the change in the spectrum, the closer the inner edge of the disk must be to the black hole.



Multiple images of a distant quasar are visible in this combined view from NASA's Chandra X-ray Observatory and the Hubble Space Telescope. The Chandra data were used to directly measure the spin of the supermassive black hole powering this quasar. This is the most distant black hole where such a measurement has been made. (X-ray: NASA/CXC/Univ of Michigan/R.C.Reis et al; Optical: NASA/STScI)

By measuring the spin of distant black holes, researchers discover important clues about how these objects grow over time. If black holes grow mainly from collisions and mergers between galaxies, they should accumulate material in a stable disk, and the steady supply of new material from the disk should lead to rapidly spinning black holes. In contrast, if black holes grow through many small accretion episodes, they will accumulate material from random directions. Like a merry-go-round that is pushed both backward and forward, this would make the black hole spin more slowly.

The ability to measure black hole spin over a large range of cosmic time should make it possible to directly study whether the black hole evolves at about the same rate as its host galaxy. The measurement of the spin of the RX J1131-1231 black hole is a major step along that path and demonstrates a technique for assembling a sample of distant supermassive black holes with current X-ray observatories.

Prior to the announcement of this work, the most distant black holes with direct spin estimates were located 2.5 billion and 4.7 billion light-years away.

NASA's Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory in Cambridge, Mass., controls Chandra's science and flight operations.

For Chandra images, multimedia and related materials, visit [here](#).

Volunteers Sought for Special Olympics on April 9



Debbie Allen, a human resources specialist in the Marshall Space Flight Center's Human Resources Services Office -- center, facing the camera -- cheers on an athlete in the 2012 Special Olympics at Milton Frank Stadium in Huntsville, along with her daughter Brandy, left, and Sherry Hopper, a personnel security specialist in the Marshall Center's Protective Services Office. Additional volunteers are needed for the 2014 Special Olympics to escort Olympians to various sporting events. This event is typically held in the fall during the Combined Federal Campaign Community Service Days; however, it was postponed due to construction at Milton Frank Stadium. Visit the [Volunteer Signup](#) webpage to register. For additional information, contact [Victoria Dixon](#) or [Kristin Pollard Kiel](#). (NASA/MSFC/Fred Deaton)

NASA Administrator's Marshall Center Visit and a New Space Act Agreement Make News on NASA-TV

The March 14 visit by NASA Administrator Charlie Bolden to the Marshall Space Flight Center is featured in the latest edition of "[This Week @NASA](#)," a weekly video program broadcast nationwide on NASA-TV and posted online. Bolden toured various areas at Marshall, but his primary reason for visiting was to get an update on the progress of NASA's [Space Launch System](#) program, specifically, the vehicle's flight software and avionics.

The Marshall Center also hosted a press conference announcing an enhanced collaboration with Sierra Nevada Corp., of Louisville, Colo. The company is designing Dream Chaser -- a spacecraft for low-Earth orbit -- and the Marshall Center will help with planning and development of scientific payloads for Dream Chaser missions. You can watch this and previous episodes of This Week @NASA at the [NASA-TV YouTube channel](#).

Obituaries

Joseph Claude Thompson, 98, of Knoxville, Tenn., died March 3. He retired from the Marshall Center in 1978 as a logistics management specialist. He is survived by his wife, Muriel Knowling Thompson.

William Maelon Campbell, 88, of Taft, Tenn., died March 7. He retired from the Marshall Center in 1980 as an electrical engineer. He is survived by his wife, Christine Fleming Campbell.

Jim McQueen, 84, of Huntsville, died March 7. He retired from the Marshall Center in 1988 as an aerospace engineer.

Mavis Angeline "Angie" King Adcock, 76, of Toney, died March 7. She retired from the Marshall Center in 1995 as a personnel assistant. She is survived by her husband, Allen Adcock.

Doris Ann Pritchett Spivey, 77, of New Hope, died March 8. She retired from the Marshall Center in 1981 as a secretary.